

# Production of Oral Vaccines Based on Virus-Like Particles Pseudotyped with Protozoan-Surface Proteins

Rupil, Lucía Lara dir. 

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## Resumen

*Giardia lamblia* is the only known parasite that can inhabit the harsh upper gastrointestinal tract, where most of the digestive proteases are secreted. Intestinal and free-living protozoa express surface proteins containing an extraordinarily high percentage of cysteine. These cysteine-rich variant-specific surface proteins (VSPs) form a dense coat on the entire surface of *Giardia* trophozoites, that coat protects the parasite inside the host intestine. VSPs not only are resistant to proteolytic digestion, extreme pH and temperatures, but also stimulate host immune responses. These properties can be used to protect as well as to increase the immunogenicity of vaccine antigens for oral administration. The incorporation of VSPs onto virus-like particles bearing viral antigens allows oral administration of these vaccines, protecting the antigens from degradation and generating robust and protective immune responses. In this chapter we describe the development of this versatile vaccine platform for the generation of safe, stable, and efficient oral vaccines, including their production and validation, as well as the characterization of immune response to oral immunization.

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